

Remarks

In accordance with the above amendments the original claims have been cancelled and replaced with new claims 30-60. New claims 30-47 are directed to polymerization catalysts. New claims 48-60 are directed to olefin polymerization processes.

It is acknowledged that in response to the restriction requirement an election was made to prosecute the catalyst composition claims. It is, however, respectfully requested that all these claims be examined together. The process claims specifically require the employment of catalysts of the type set forth in the elected claims. Accordingly the claims are clearly related and should be examined together, particularly if the catalyst composition claims are found to be allowable.

In the new claims an attempt has been made to use the word "composition" instead of the word "system" even though in the total context of the application the two terms are considered to indicate the same thing.

In the newly submitted claims it is considered that all the objections made under 35 U.S.C. 112 have been avoided.

It is submitted that the new claims are not anticipated by the Konrad et al. reference. The new catalyst composition claims specify the employment of a special type of catalyst composition which results from the combination of a chromium catalyst having a pore volume of at least 1.8 g/cc and a surface area of at least 400 m²/g which is produced by contacting a chromium-containing, titanium-containing, silica-containing solid with carbon monoxide under conditions such that a substantial portion of the chromium is in the divalent state, and a cocatalyst selected from the group consisting of (i) alkyl lithium or aryl lithium compounds, (ii) dialkyl aluminum alkoxides in combination with at least one compound selected from the group consisting of alkyl zinc compounds, alkyl aluminum compounds, and alkyl boron compounds, and (iii) mixtures thereof. This particular type of catalyst produced polymers of ethylene having particularly desirable properties. Specifically, it produces relatively high molecular weight polymer which is capable of insitu formation of hexene comonomer. The catalyst is particularly useful in that it can be combined with a Ziegler-Natta catalyst system to yield a bimodal polymer in which there is short-chain branching due to hexene incorporation in the high molecular weight end of the molecular weight distribution.

The Konrad reference discloses using alkyl lithium as a cocatalyst for a chromium-containing catalyst, however, the chromium-containing catalyst is one which has been oxidized. There is nothing in the Konrad patent which suggests what would happen if one used an alkyl lithium as a cocatalyst for a CO-reduced, chromium-containing catalyst system. Further, the present claims require that the chromium catalysts have a pore volume of at least 1.8 g/cc and a surface area of at least 400 m²/g. The Konrad patent does not appear to provide any details regarding any preferred range of surface area or pore volume.

The new claims are also submitted to be patentable over the disclosure of Witt. The Witt patent discloses a catalyst comprising a supported chromium oxide in combination with a mixture of an organoboron compound and a hydrocarbyl aluminum hydrocarbyl oxide. The catalyst of the Witt patent is like the catalyst of Konrad, i.e. not a chromium catalyst which has been CO-reduced. Note specifically where in column 2, lines 27-29, the patent indicates that a substantial portion of the chromium is in the hexavalent form.

It is further submitted that the new claims are patentable over the combination of Witt or Konrad in view of Schulze. While it is true that

the Schulze patent discloses a chromium-containing catalyst which has been reduced with carbon monoxide, it is submitted that the reference does not suggest using that catalyst in combination with a cocatalyst. Further, there is no suggestion in the combination of references to employ the cocatalyst disclosed in Witt or Konrad with the CO-reduced chromium catalyst of Schulze.

It is further submitted that the new claims are patentable over the combination of Witt or Konrad with the Benham et al. patent. The Benham patent teaches that a CO-reduced chromium catalyst can be combined with a particular type of Ziegler-Natta catalyst to produce a polymer having broadened molecular weight distribution. The Benham patent does not, however, suggest using a cocatalyst of the type disclosed in Witt or Konrad in such a catalyst system. Since the catalyst systems of Witt and Konrad were chromium catalysts containing hexavalent chromium rather than being CO-reduced chromium catalysts, there is no basis for assuming that it would have been obvious to employ the cocatalysts which they disclosed with a CO-reduced chromium catalyst.

It is yet further submitted that the new claims are patentable over the combination of Konrad or Witt in view of McDaniel.

The McDaniel patent employs a chromium catalyst containing hexavalent chromium rather than a CO-reduced chromium catalyst. The McDaniel patent is actually another patent dealing with a dual catalyst system prepared by combining the specified chromium catalyst with a specific type of zirconium catalyst. In column 7, lines 12 through 26, it specifies that the cocatalyst used for the dual catalyst system are selected from hydrocarbyl- borane compounds and alkylaluminum compounds. The combination of the three references thus provides nothing regarding the use of a CO-reduced catalyst nor the use of the specific types of cocatalysts required by the present claims.

In view of the newly submitted claims and the foregoing remarks, it is submitted that this case should now be in condition for allowance. Reconsideration and allowance are respectfully requested.

Respectfully submitted,

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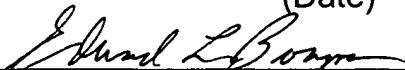
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